

## JATROPHA- a boon to the 21<sup>st</sup> century

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### **Abstract:**

*The wonder plant Jatropha is commonly known as American purging nut, Barbados nut, curcas bean, hell oil. Jatropha curcas belongs to the family EUPHORBIACEAE (Spurge family) which is a flowering plant. It is native to the tropical areas of the Americas from Mexico to Argentina and has been spread throughout the world in tropical and subtropical regions around the world. It's distribution became cosmopolitan slowly according to the time. It is a prominent cash crop which is a perennial, C3 plant and it's a prominent source of biodiesel. It can thrive in poor and stony soils, although new research suggests that the plant's ability to adapt to these poor soils is not as extensive as had been previously stated.*

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Why I called it as a boon because the seeds of jatropha have enough potential to replace the petrol or diesel requirements of the present day without any pollution issues and the most vital use of this jatropha is it's a renewable resource. So, this aids in conservation of the fossil fuels.

Botanical description:

Flowers: male and female flowers are produced on the same inflorescence, averaging 20 male flowers to each female flower, or 10 male flowers to each female flower. The inflorescence can be formed in the leaf axil. Plants occasionally present hermaphroditic flowers and complete germination is achieved within 9 days.

Seeds: the seeds are mature when the capsule changes from green to yellow. The seeds contain around 20% saturated fatty acids and 80% unsaturated fatty acids, and they yield 25–40% oil by weight.

In addition, the seeds contain other chemical compounds, such as saccharose, raffinose, stachyose, glucose, fructose, galactose, and protein.

The oil is largely made up of oleic and linoleic acids.

Furthermore, the plant also contains curcasin, arachidic, myristic, palmitic, and stearic acids and curcumin.

Fruits: fruits are produced in winter, or there may be several crops during the year if soil moisture is good and temperatures are sufficiently high. Most fruit production is concentrated from midsummer to late fall with variations in production peaks where some plants have two or three harvests and some produce continuously through the season.

What is Bio diesel?

It is an alternative clean-burning renewable fuel similar to conventional diesel that is non toxic and emit very few pollutants. It is produced using animal fats, vegetable oils, and waste cooking oil. Due to its biodegradable nature, it is used as a replacement for fossil diesel fuel.

Biodiesel is less denser than water (0.86-0.92g/ml).

What is the use of bio diesel now in India?

To reduce the emission of harmful gases from burning of petrol and diesel.

To save environment and to conserve the reserve fossil resources.

As diesel is so costly, we have to look after towards new renewable resources which can replace it or matches its performance.

Even though some extension programmes are being done, a lot more awareness should be developed in people towards biodiesel usage, farmers to cultivate this profitable cash crop and also in the business tycoons so they come up with the projects in this matter thereby boosting the production of biodiesel in India.

Some sources of Biofuel:

- Algae
- Carbohydrates (rich in sugars)
- Agricultural or farmyard waste
- Some seeds of exotic plants

Jatropha has the most possible potential and is now the aim of government to establish biofuel across the country.

Italy is trying to produce biodiesel from rapeseed oil.

Biodiesel implementation in India:

The govt. of Andhra Pradesh has signed a MOU with Reliance group. Authorities have told that they have been planning the plantation of Jatropha on a large scale in the delta regions of Krishna and Godavari covering the Godavari districts and the Krishna districts.

RIL also signed agreements with 1,200 farmers for one- and two-year-old jatropha plantation on 2,200 acres of wasteland in Nizamabad, Andhra Pradesh.

However, after seeing the successful production potential of biodiesel via. Jatropha in Andhra Pradesh, the western states like Gujarat, Rajasthan and the central states like Madhya Pradesh.

Indian railways have taken an important initiative to successfully test run 'Jan Shatabdi Express' from Delhi to Chandigarh exclusively on biodiesel produced from the Jatropha seeds.

Mahindra & Mahindra have also conducted large scale trials of operating their tractors on biodiesel.

Mercedes Benz is sponsoring Jatropha plantation with a commitment to use biodiesel run their cars.

Chemical Scenario of biodiesel production:

The biodiesel is produced via. A process called *transesterification*. In this process the oil extracted from the jatropha seed is converted into biodiesel. The triglyceride molecule reacts with the alcohol group in the presence of a strong base like KOH, NaOH to produce fatty acids and glycerol. So, in this way the biofuel is extracted from the oil extracted from seed. The glycerol obtained here can be used in manufacturing soaps shampoos etc.

Yield of oil from seed vs. quantity of biodiesel produced:

Jatropha seedlings should be planted with 2m x 2m spacing.

Mostly 20-30% of the seedlings wouldn't survive and the rest of them sets seeds after a year. Seed production ranges from about 0.4 t/ha in the first year to over 5 t/ha after 3 years. Around 1,950 to 2,225 trees can be planted in 1 hectare and nearly 1000 in an acre. One hectare 7 tonnes of seeds and it yields 2.2 to 3 tonnes of oil. After 5 years a typical yield from a single jatropha plant is about 3.5 to 3.9 kg beans. However, for good yields it takes 3.5 to 5 years to get higher yields.

To produce 1 lit of biodiesel 4kgs of oil is required (i.e) one hectare generates 1,750 litres of biodiesel and a plant after 5 years generates 750 ml of biodiesel. Oil from the seed is extracted by the method of cold pressing and by the process of transesterification the extracted oil is converted into biodiesel.

And the seed cake that will be obtained after pressing can be composted and can be used as green manure which has high percentage of nitrogen.

Yield can be increased with adding a suitable fertilizer consisting of calcium, sulphur and magnesium.

Latest advances in Jatropha curcas:

1. The scientists of TNAU(Tamil Nadu Agricultural University) have made a cross between J. curcas and J. integerrima produced successful hybrids with more seed set but produces small sized fruits, so it is backcrossed to get big sized fruits, more seed set and disease resistant.

2. Development of efficient techniques for clonal multiplication of Jatropha curcas by the dept. of forestry at Haryana Agricultural University.

3. As a part of Atmanirbhar bharat the Indian government has took an initiative to convert the wastelands across india as jatropha fields.

Demerits of biodiesel:

- Biodiesel is also more solvent than petro-diesel and so it will rapidly break down any deposits of old residue in a vehicle's fuel lines and fuel tank and clog the fuel filter. Therefore, after making the transition to biodiesel it is important to change the fuel filter around 1000 miles after switching.

- The long harvest cycle of Thirty to Forty years locks the land use.

- Needs minute changes in the engines we use in the current era.

- Labour needs are intensive while harvesting and also this crop is tough to cultivate in small countries.

### References:

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